

What Is Claimed Is:

1. An exposure method in which a plurality of times
of exposure is performed on a same photosensitive object
5 wherein

the substantial wavelength of an exposure light in a
space between a projection optical system, which projects said
exposure light on said photosensitive object, and said
photosensitive object is different in at least one exposure
10 in said plurality of times of exposure from another exposure.

2. The exposure method according to Claim 1 wherein
in said at least one exposure, said space is in a state
filled with a predetermined liquid.
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3. The exposure method according to Claim 2 wherein
in said another exposure, said space is in a state
filled with another liquid of a different type from said
predetermined liquid.
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4. The exposure method according to Claim 3 wherein
said predetermined liquid has refractive index larger
than the refractive index of said another liquid.

5. The exposure method according to Claim 3 wherein
said another liquid has solubility to a specific
material contained within a photosensitive agent of said
photosensitive object lower than said predetermined liquid.
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6. The exposure method according to Claim 2 wherein in said another exposure, said space is in a state not filled with liquid.

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7. The exposure method according to Claim 6 wherein said at least one exposure is performed prior to said another exposure.

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8. The exposure method according to Claim 6 wherein said at least one exposure is performed after said another exposure is performed.

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9. The exposure method according to Claim 1 wherein a wavelength of an exposure light made to enter said projection optical system in said at least one exposure is different from a wavelength of exposure light in said another exposure.

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10. The exposure method according to Claim 1 wherein in said at least one exposure, a phase shift method is used.

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11. A device manufacturing method including a lithography process wherein

the exposure method of any one of Claims 1 to 10 is performed to expose a photosensitive object a plurality of times.

12. An exposure method in which a plurality of times of exposure is performed on a same photosensitive object, said method comprising:

5 a process in which under a first exposure condition where a substantial wavelength of said exposure light in a space between an optical member and said photosensitive object is a first wavelength, said photosensitive object is exposed by said exposure light of said first wavelength,; and

10 a process in which under a second exposure condition where a substantial wavelength of said exposure light in a space between said optical member and said photosensitive object is a second wavelength different from said first wavelength, said photosensitive object is exposed by said
15 exposure light of said second wavelength.

13. The exposure method according to Claim 12 wherein exposure under said first exposure condition is an immersion exposure performed in a state where said space is
20 filled with a predetermined liquid.

14. The exposure method according to Claim 13 wherein exposure under said second exposure condition is an immersion exposure performed in a state where said space is
25 filled with another liquid different from said predetermined liquid.

15. The exposure method according to Claim 14 wherein

said predetermined liquid has a refractive index different from said another liquid.

16. The exposure method according to Claim 15 wherein
5 said predetermined liquid has a refractive index larger than said another liquid.

17. The exposure method according to Claim 14 wherein
 said another liquid has solubility to a specific
10 material contained within a photosensitive agent of said photosensitive object different from said predetermined liquid.

18. The exposure method according to Claim 17 wherein
15 said another liquid has solubility to said specific material contained within said photosensitive agent of said photosensitive object smaller than said predetermined liquid.

19. The exposure method according to Claim 13 wherein
20 exposure under said second exposure condition is a dry exposure performed in a state where said space is not filled with liquid.

20. The exposure method according to Claim 19 wherein
25 said exposure under said first exposure condition is performed prior to said exposure under said second condition.

21. The exposure method according to Claim 19 wherein

said exposure under said first exposure is performed after said exposure under said second exposure has been performed.

5 22. The exposure method according to Claim 12 wherein wavelength of exposure light made to enter said optical member in exposure under said first exposure condition is different from the wavelength of exposure light in exposure under said second exposure condition.

10 23. The exposure method according to Claim 12 wherein in said exposure under said first exposure condition, a phase shift method is used.

15 24. The exposure method according to Claim 12 wherein said exposure under said first exposure condition and said exposure under said second exposure condition are severally executed in a different exposure apparatus.

20 25. The exposure method according to Claim 12 wherein said exposure under said first exposure condition and said exposure under said second exposure condition are severally executed in a same exposure apparatus.

25 26. A device manufacturing method including a lithography process wherein
the exposure method of any one of Claims 12 to 25 is performed to expose a photosensitive object a plurality of

times.

27. An exposure apparatus that performs a plurality of times of exposure on a same photosensitive object, said
5 apparatus comprising:

a stage that holds said photosensitive object;

a projection optical system that projects an exposure light on said photosensitive object;

an adjustment unit that adjusts a substantial
10 wavelength of said exposure light in a space between said projection optical system and said photosensitive object; and

a control unit that controls said adjustment unit when exposing said photosensitive object a plurality of times so that in at least one exposure of said plurality of times, said
15 substantial wavelength of said exposure light in said space is different from the wavelength in another exposure.

28. The exposure apparatus according to Claim 27 wherein

20 said adjustment unit comprises a liquid supply mechanism that supplies a predetermined liquid so that in a space between said projection optical system and said stage, at least a space between said projection optical system and said photosensitive object on said stage is filled with said
25 liquid, whereby

said control unit controls said adjustment unit so that said liquid supply mechanism supplies said liquid to said space between said projection optical system and said

photosensitive object on said stage in said at least one exposure, whereas in said another exposure said liquid supply mechanism does not supply said liquid to said space.

5 29. The exposure apparatus according to Claim 27 wherein

 said adjustment unit comprises a liquid supply mechanism that supplies any one liquid of a plurality of types of liquid so that in a space between said projection optical
10 system and said stage, at least a space between said projection optical system and said photosensitive object on said stage is filled with said liquid, whereby

 said control unit controls said adjustment unit so that said liquid supply mechanism supplies a predetermined liquid
15 of said plurality of types of liquid to said space between said projection optical system and said photosensitive object on said stage in said at least one exposure, whereas in said another exposure said liquid supply mechanism supplies a liquid different from said predetermined liquid to said space.

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 30. A device manufacturing method including a lithography process wherein

 a device pattern is transferred onto a photosensitive object by using the exposure apparatus according to any one
25 of Claims 27 to 29.

 31. An exposure system that performs exposure on a same photosensitive object a plurality of times, said system

comprising:

a first exposure apparatus whose substantial wavelength of an exposure light in a space between a projection optical system, which projects said exposure light on said photosensitive object, and said photosensitive object is a
5 predetermined length; and

a second exposure apparatus whose substantial wavelength of an exposure light in a space between a projection optical system, which projects said exposure light on said
10 photosensitive object, and said photosensitive object is longer than said predetermined length.

32. The exposure system according to Claim 31 wherein
in said first exposure apparatus, a predetermined
15 liquid is filled between said projection optical system and said photosensitive object when said exposure light is projected on said photosensitive object.

33. The exposure system according to Claim 32 wherein
20 in said second exposure apparatus, another liquid having a refractive index smaller than said predetermined liquid is filled between said projection optical system and said photosensitive object when said exposure light is projected on said photosensitive object.

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34. The exposure system according to Claim 32 wherein
in said second exposure apparatus, liquid does not exist between said projection optical system and said

photosensitive object when said exposure light is projected on said photosensitive object.

35. The exposure system according to Claim 31 wherein
5 said first exposure apparatus is larger than said second exposure apparatus in number.

36. The exposure system according to Claim 31, wherein
oscillation wavelength of a light source emitting said
10 exposure light of said first exposure apparatus is different from oscillation wavelength of a light source emitting said exposure light of said second exposure apparatus.

37. A device manufacturing method including a
15 lithography process wherein

a device pattern is transferred onto a photosensitive object by using the exposure system according to any one of Claims 31 to 36.